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THE ORIGIN AND PURPOSE OF THE HORNS AND ANTLERS OF RUMINANTS.

By Allan Gordon Cameron.

I. Introductory.

In the second part of Darwin's great work upon the 'Descent of Man' (chap. xvii.), the frontal weapons of ruminants, whether horns or antlers, are derived from the principle of sexual selection as the result of male struggle and combat for the possession of the female. This view has been generally accepted by naturalists, and seriously questioned, so far as I am aware, by no authoritative writer on the subject. The law of battle, leading to superior calibre, and the power of charm, leading to superior ornament, seem to admit of particularly forcible application to the cranial armature of those polygamous and herding animals whose sexual combats are so determined, and whose weapons of war are so conspicuously ornamental. Dr. Wallace, who refuses for the most part to recognise a *vera causa* in Darwin's brilliant hypothesis, concedes and restricts its application to the subject under discussion; while Dr. Romanes, writing from Darwin's standpoint, affirms that in "arborescent antlers" we have phenomena which can be explained only by sexual selection "if they are to be explained at all."

It was wisely said by Jevons that almost every problem in science takes the form of a balance of probabilities; but a new

hypothesis must at least agree with the particular facts which it is framed to explain, and, assuming that these facts are properly established, it must agree with all of them. Tested by the facts to which it is here applied, the hypothesis of sexual selection is proved incompetent to play the part assigned to it; and is found superfluous, because the broader principle, which secures the preservation of favoured races in the struggle for life, provides a fitter explanation of the phenomena in question. To establish this conclusion will be the end of the present paper.

Antlers and horns, when viewed as something more than the familiar trophies of sportsmen, represent the comparatively finished product of a long biological adjustment, the factors of which can be found only in the life-history of existing ruminants. Two questions in chief are suggested by the study of these weapons, and must be met by any sufficient explanation of them. (i.) Inquiry into their purpose leads us to consider the type or style of weapon as an adaptation of means to ends, and asks the question how they came to be fashioned in this particular way? (ii.) Inquiry into their origin leads us to consider their partial limitation as to sex, and asks the question why they are variably present or absent in the females of genera and species whose males possess them generally?

Facing the subject from the standpoint of sexual selection, Darwin confronted difficulties in both respects, and stated them with characteristic frankness. In respect of structure, he rightly judged that the curiously curving horns of Antelopes, no less than the branched antlers of Deer, were weapons ill adapted to the purposes of sexual warfare between butting animals; failing as an adjustment for attack, because (as Caton also thought) a single straight point would have proved a far more deadly weapon; and disadvantageous as an adjustment for defence, because the complex types were liable to become interlocked with fatal result to both combatants. Explained as the effect of charm consequent upon female choice, "arborescent antlers" are beset with further difficulties. As Darwin recognised, they weight their owners with needless, if not injurious, ornament, and force the somewhat hazardous conclusion that female preference in the struggles of sex must handicap chosen males in the sterner struggle for life. Female choice in pairing does not, however, exist with herding ruminants in a state of nature, because the more

vigorous males take forcible possession;* and, even were it otherwise, the struggle for life would render the charm of useless ornament inoperative. Complex cranial weapons have survived, therefore they have once been useful, though sexual selection leaves their utility unexplained.

Equal difficulties arise, on the hypothesis, from the consideration of frontal weapons in respect of sex. A theory of horns and antlers, which finds their origin and purpose in the sexual strife of rival males, requires the normal limitation of such weapons to the sex for whose benefit they were primarily developed and by whose combats they have been conditioned through time. Their normal presence in the females of half the genera, representing all the families, of surviving ruminants which exhibit them, argues their mutual utility, and thence a wider purpose with a common origin. In other words, structural characters which are present in both sexes, whether partially or universally, possess a functional importance common to either sex, or they do not. If they are evidently useful, there is a strong presumption that they owe their existence to a primary adaptation for the common purpose, with which sexual selection, whether by male combat or by female choice, can have absolutely no concern. If they are useful to the males only, their enduring presence in the females unquestionably conflicts with the retrogressive principle of natural selection, which promotes the degradation and disappearance of superfluous and wasteful organs. Darwin touched here an aspect of the problem which was vital to his theory as a whole, and cut the knot with Alexander's sword. Carrying his argument into the wide battle-ground of inheritance, he reached the conclusion that characters originally proper to either sex might be transmitted to the same sex, or to both, according to the form of inheritance assumed in transmission, and independently of natural selection.† To this conclusion, as applied to the presence or absence of frontal

* The instance of a Red-deer hind referred to by Darwin is a case not of *choice* on the part of the female, but of *chance* on the part of an inferior male, while his superior is engaged elsewhere—a very different matter.

† The embryological data, to which Darwin attached great importance, admit of a phylogenetic interpretation which supports the view that the presence of frontal weapons in both sexes was a primitive character.

weapons in female ruminants, there is the logical, yet sufficient, objection (1) that we have no evidence in support of the explanation other than the facts which it is framed to explain; and (2) that in the explanation itself we invoke an unknown force which really adds a greater puzzle to a less. Horned and hornless females occur not only among genera constituting families, and among species constituting genera, but even among individuals constituting species, which occupy the same area of distribution and are subject to similar conditions of life. Horned females, moreover, exhibit horns, as Darwin pointed out, in every stage of a graduated series, from those which are of equal calibre with the male weapons, to those which are of lesser calibre, to those which are rudimentary, to those which are disappearing. In ascribing all such cases to distinct forms of inheritance acting concurrently yet indefinitely in the alternate transference or non-transference of masculine characters without regard to use or purpose, we enter a region of speculation which betrays the weak point of our hypothesis.*

Apart, however, from any question of sex or structure, the derivation of frontal weapons through sexual selection rests upon a fundamental error of fact in taking too easily for granted, that the possession of the female depends upon the calibre of the horns or antlers of the male, or upon the presence of such weapons at all—even in those species which normally exhibit them highly specialised. Unquestionably among existing ruminants, whether horned or antlered, the rights of the harem are governed by the law of battle: but the law of battle is the law of the prize-ring—that the fortune of war favours the heavy weight, and the science of sexual warfare is the primitive science of the battering-ram, which decides the issue in the clash of skulls by the force of impact, and by the pressure of bodily weight behind it, irrespective of the calibre of the weapon. It is a common experience with British stock-breeders that the lighter horned breeds of sheep and cattle are not a match for their heavier hornless congeners; and the carefully observant Caton notes of

* The legitimate assumption that "latent characters belonging to the other sex are always present in each sexually differentiated organism" (Weismann) does not help us to decide what these characters may be for a particular sex and in a particular case,—a matter which can be determined only from the facts as we find them.

the Wapiti Deer confined in his park at Ottawa, that the largest antlers ever grown in his grounds were carried by a medium-sized Deer who, in common with several others, was always subject to the control of a larger Deer with smaller antlers than any of them. But a theory relating to wild animals may reasonably object to arguments drawn from domestic or semi-domesticated subjects, reared in artificial conditions and leading an artificial life, from which we can infer only what will happen if the conditions remain the same. Our *experimentum crucis*, or crucial test, must relate to ruminants in a state of nature, and under circumstances which place the issue beyond the shadow of a doubt. Dr. Wallace has observed with justice that "the power of predicting what will happen in a given case is always considered to be a crucial test of a true theory;" and to this we may add that when the predicted event happens to be the one legitimate deduction from our assumed premisses, a conflicting result is necessarily fatal to the hypothesis. In the common stag we have the typical member of a group (*Cervus*) endowed with remarkably combative instincts and possessed of remarkably formidable weapons. These weapons are limited by inheritance to the males, and, according to the theory of sexual selection, have undoubtedly been acquired as sexual weapons for fighting with their fellow males. If we suppose, for argument, that a stag absolutely devoid of the highly specialised cranial armature which distinguished his fellows should strive to take and hold a harem against these antlered rivals, how, on the theory, should we estimate his chances of success? There is but one possible answer to such a question consistent with the hypothesis, and we know that Darwin gave it; yet the fact, though the great naturalist was unaware of it,* is just the other way. "Bald" stags without antlers, but otherwise perfectly vigorous, probably cases of atavism, are of constant occurrence among the wild Red-deer of North Britain. Though wielding no weapon and displaying no ornament they prove to be in all respects a match for their armed and (theoretically) more attractive rivals, are

* Mr. McNeill, of Colonsay, to whom Darwin applied for information about the combats of Red-deer, can hardly have been unaware of a fact which is of constant occurrence in the Island of Jura, where his experience of Red-deer was gained; but he was evidently unaware of its significance to the theory of the great naturalist.

usually master stags, and sometimes acknowledged monarchs of large herds. In other words, a Deer fighting for a harem with the bare forehead of his Miocene ancestors achieves success, sustained and repeated, against rivals armed with complex and deadly weapons, laboriously fashioned by countless ages of sexual selection towards the very purpose for which they are now proved useless.

The theory of sexual selection must therefore be set aside as a scientific account of the origin and purpose of the frontal weapons of ruminants. It does not explain their structure as an adaptation to the assumed purpose, nor does it explain their presence in both sexes as a result of the assumed origin, while it is in absolute conflict with established facts relative to sexual combat between armed and unarmed individuals of a species.

But the success of the bald stag in sexual warfare, which forbids our finding in the discarded hypothesis a *vera causa* for the derivation of frontal weapons, unmistakably indicates in what direction we must look for a true key to the puzzle. Everyone who has hunted wild Deer with hounds, whether slow or swift, knows that an unarmed stag would instantly be torn to pieces where a well-equipped Deer would kill his canine adversaries or fight his way through. "The dog that would fly into the face of a sambar stag is perfectly certain to meet a glorious death," writes Sir Samuel Baker, whose wide experience of this particular sport lends authoritative weight to the statement; and Lloyd has recorded how the Swedish Elk, when pressed by hungry wolves, will strike one dead with a single blow. Referred to a similar purpose, the horns of Antelopes, which, from the point of view of sexual combat, proved so great a puzzle to Darwin, exhibit throughout their several types a corresponding adaptation. Weapons that "seem singularly ill fitted" for the strife of rival males, present when lowered to a carnivorous foe prepared to spring a brace of spears in rest or sabres prompt to thrust on either side. Sir Samuel Baker describes the horns of the Hartebeest as "carefully arranged for defence"; and "it seems to be undisputed that the spear-like horns of the Gemsbok are sufficiently formidable to repel the attack of the Lion" (Lydekker). Of the Beisa Antelope, Mr. Blanford writes that "their long, straight horns are most deadly weapons"; and of the Sable Antelope Mr. Selous tells us that "like the Roan Antelope and

Gemsbuck it will commit terrible havoc amongst a pack of dogs—indeed, I have known one to kill three with three consecutive sweeps of its long scimitar-shaped horns."* Further illustration of a defensive purpose will be found in the (historically) later, and more familiar, bovine types which include the wild and domesticated sheep and oxen. From the unimpaired fighting ability of hornless breeds we have already seen reason to infer that, in sexual combat dependent on a clash of foreheads, laterally spreading horns are of small account; but sufficient proof of their service as defensive weapons appears in the single fact that the Buffaloes of Asia and Africa are a match for the largest felines of their respective continents.

These facts unavoidably prompt the question whether the horns and antlers of ruminants are not the biological answer to carnivorous teeth and claws—evoked by the necessities of race-preservation in the struggle for life, and fashioned by natural selection so as to unite comparative immunity in sexual warfare with fatal efficiency against common foes? In this double purpose working to the one result, protective adaptation, may we not read the secret of the form and development of frontal weapons from the simplest to the most complex? and may we not thus account for the apparently anomalous fact, that weapons which are dangerously effective in regard to the external enemies of a species, become relatively innocuous in the strife of its fellow-members one with another? I believe the facts authorise an affirmative answer to these questions, and I propose to consider them in three respects, historical, structural, and sexual, in the order named. Assuming that horns and antlers are the result of a protective adjustment consequent upon the mutual relations subsisting between ungulates and carnivores through Tertiary time, it becomes of primary importance to inquire how far the history of these relations corresponds with the requirements of our theory. We shall then be in a position to consider, in the second place, the type or style of weapon as a structural adapta-

* The defensive powers of the larger Antelopes have recently been made a subject of remark by Count Teleki (on the Eland), Mr. F. J. Jackson (on the Oryx), and Mr. K. A. Bryden (on the Gnu). A notable instance will be found in Mr. Selous's fascinating book on 'Travel and Adventure in S.E. Africa,' p. 190.

tion of means to ends; and to ask, in the third place, why such weapons are variably present or absent in the females of genera and species whose males possess them universally.

II. Historical.

In the history of frontal weapons the salient feature is their gradual evolution in an ascending scale; in the history of ungulates, it is the immense surviving majority of horned and antlered genera; in the history of carnivores, it is the early appearance in geological time of highly specialised and destructive types. I shall endeavour to show the bearing of these facts upon a protective theory of horns and antlers.

Sexual selection, in fixing the attention upon a particular class of phenomena, leads us to over-estimate the part played by sexual passion, and to under-estimate the part played by self-preservation, in the struggles of ungulate life during the slow succession of ages, when the inhabited earth was nothing but a wide hunting ground at the mercy of the Cats and Dogs. Our "zoologically impoverished world"—our civilisation, which keeps in check the larger flesh-eaters that still wait upon extinction—even our subjective notions of "the ethical aspects of evolution," combine to hide from view the long reign of feline and canine "butchering machines, which have succeeded one another through the Tertiary epoch, therefore for many thousands, or more probably millions, of years" (Huxley), and have marked the course of the ungulates in history with a continuous stream of blood. Darwin's consoling optimism that, in the struggle for life, "the war of nature is not incessant, that no fear is felt, that death is generally prompt," is irreconcilable with the experience of those conversant with wild countries and wild beasts. Sexual passion—the reproductive instinct—occupies less than a tenth part of normal ruminant life; fear—the self-preserving instinct—rules the whole of it. "The beasts of prey," writes a competent authority (Sir Samuel Baker), "are the terror of the weaker species, which cannot even assuage their thirst in the hottest season without halting upon the margin of the stream and scrutinising the country right and left before they dare to stoop their heads to drink. Even then the herd will not drink together, but a portion will act as watchers, to give notice of an enemy should it be discerned while

their comrades slake their thirst."* Hunting man adds to these fears, but is also feared by the beasts of prey, which before his coming knew no restraint save their surly respect for one another, and suffered no check save from the defensive armature of their intended victims. Among the destructive agents of Tertiary times a unique position was held by the (now extinct) Machærodonts, tiger-like felines with immensely-prolonged upper canine teeth, recurved sabre-like and sometimes with serrated edges, enabling them "to retain like barbs the prey whose quivering flesh they penetrated" (Owen). Members of the genus exhibiting "the most specially carnivorous type of dental structure known" (Lydekker) appear in the Eocene (Phosphorites of Quercy) and traverse the whole of the Tertiary period, the scourge alike of the Old and of the New World. Associated with the early Machærodonts were ancestral Dogs, foreshadowing the Bears on the one hand (*Amphicyon*) and the Civets on the other (*Cynodictis*); while from the Pliocene, and onwards, Lions and Tigers allied to living species, and true *Canidæ*—Dogs and Wolves, hunting their prey in packs and of world-wide distribution—swelled the grim record of flesh-eaters and forced the unremitting slaughter of hosts of ungulates. In this great struggle the more adaptive ungulate groups, chiefly of the pair-hoofed section (*Artiodactyles*), becoming specially modified for a defensive purpose, survived and multiplied; but the less adaptive groups, chiefly of the odd-hoofed section (*Perissodactyles*), failing modification in this respect, were slowly exterminated.

He who surveys to-day the roll of existing ungulates in a state of nature cannot fail to reflect upon the great numerical preponderance of horned and antlered genera over those devoid of cranial armature. Of the perissodactyle section there survive but three genera (*Tapirus*, *Equus*, *Rhinoceros*), and one of these is horned; while of the artiodactyle section we have fifty genera, forty of which are claimed by ruminants with horns or antlers, and four by Pigs with tusks. Yet at the dawn of Tertiary time the balance of numbers was far the other way. In the gypsum

* Comp. Mr. Selous on "the cold cruelty of Nature's inexorable laws" (*op. cit.*, 413), and Lieut. von Köhnel on the restless movement of the countless herds of animals giving life to the splendid panorama south of the Nyuki river in Brit. E. Africa—"There seemed to be always something suspicious in the air. . . ." ('Teleki Expedition,' ii. 20).

quarries of Montmartre (Eocene of France), among the fossil relics of fifty species of quadrupeds, nearly four-fifths of the whole are perissodactyle ungulates, which have left in this enduring monument not only their bones but their footprints side by side with those of their carnivorous destroyers. The use of the head for defence, facing the foe, seems to have endowed ancestral ruminants with protective capabilities, which were turned to decisive account in the development of cranial weapons. Such weapons first appear in the middle Miocene of the Tertiary geological period, bony outgrowths from the frontal region of the skull, simple or pronged, and covered with hairy skin, which marks the point of divergence to the more specialised horns and antlers that succeeded. The hair, in the one case, hardened into horn upon the bony core beneath it (*Bovidæ*); the bone, in the other case, stripped of its hairy covering, suffered alternate fracture and renewal till slowly fashioned into a deciduous antler (*Cervidæ*). Weapons of the transition survive in the horns of the Prongbuck, which cast their horny sheath like the velvet of the antler, yet retain the permanent bony core characteristic of the true horn. The stump-like appendages of the Giraffe, which seem to recall the primitive type of weapon, are not, however, a process of the skull but of independent ossification. When we reflect that the slender horns of the little Indian Blackbuck will give pause to such a relatively formidable opponent as the hunting Leopard, we need not doubt that even the simple weapons of the Miocene sufficed at the outset to inspire the destroying carnivores with a preference for unarmed prey; and that this occurred in fact we have silent, though eloquent, testimony in the complete extinction during this period of whole families of hornless ungulates. The Anoplotheres, a specialised group linking the pair-hoofed with the odd-hoofed section of the order, the tapir-like Palæotheres, the Anthracotheres, pig-like and swamp-loving, do not survive the Miocene, and are wiped out of the geological record thereafter.

Increasing destructive pressure, as carnivores multiplied and herbivores declined, was met, on the part of the *artiodactyles*, with further protective adjustment in the direction of more powerful weapons, and caused, on the part of the *perissodactyles*, a further diminution of numbers in the direction of gradual extinction. When we pass to Pliocene times, we find a ruminant fauna carrying frontal weapons absolutely differentiated and

highly specialised: true Antelopes with horns lyrate (*Gazella*), recurved (*Palæoryx*), or spirally twisted (*Palæoreas*); true stags with branched and spreading antlers; and, at the close of the period, true oxen with long horns laterally projected and curved anteriorly. Similar types recur in the Pleistocene and recent formations, but with further differentiation of horn-bearing genera (sheep and goats), and further specialisation towards increased complexity and greatly increased proportions. We find, on the other hand, that the altered numerical proportion between the armed and unarmed ungulates becomes a striking feature of each succeeding fauna. In the older Pliocene, represented by the famous Pikermi fossils, horse-like animals (*Hipparion*) are numerous, but armed ruminants (Giraffe and Antelope) already hold their own; while in the later Pliocene* of the Cromer Forest bed, artiodactyles,—including long-horned oxen, complex-anthered deer, and tusked pigs,—largely predominate, gradually (Pleistocene and Palæolithic) crowding the unarmed perissodactyles out of the historical perspective. Of the genera *Bos* and *Cervus* it may be said with truth that "there were giants in the earth in those days," armed with cranial weapons of more than proportionately gigantic size: buffaloes with long crescentic horns measuring a dozen feet along the curves from tip to tip (*Bos antiquus*); and huge elaphine stags,—some with round antlers (*Cervus Spelæus*) resembling, yet exceeding, those of the Wapiti, and some with palmed antlers (*Cervus giganteus*) of a weight and span that dwarf all existing types. These, and other species, associated with great carnivora that preyed upon them, are numerously represented in the river-gravels of Pleistocene Eurasia, and were contemporary with palæolithic man, who finally intervened to exterminate both the destroyers and the destroyed.

Thus it appears that, from the early Tertiaries (Eocene) and onwards, carnivores of destructive type have lived by incessant slaughter of ungulates; that, in the middle Tertiaries (Miocene), ancestral ruminants developed frontal weapons contemporaneously

* Prof. Boyd Dawkins assigns the Forest-bed series to "the Pleistocene, or that period when the living higher Mammalia were abundant, and not to the Pleiocene, in which there were only some three or four of the higher Mammalia present in Europe." I have followed Prof. Martin Duncan in he text, but the disputed point does not affect my argument.

with the rapid disappearance of hornless ungulate families; and that, in the later Tertiaries (Pliocene) and onwards, the development of horns and antlers follows an ascending scale which is parallel, on the one hand, with the survival, multiplication and lasting numerical preponderance of horned and antlered ungulate genera (deer, antelopes, oxen), and, on the other hand, with the decrease in a diminishing ratio to all but ultimate extinction of perissodactyle genera not similarly endowed, though starting in the race for life with a not less marked majority.*

In reaching the implied conclusion that horns and antlers were aboriginally protective weapons, we may reinforce our argument with the fact that these weapons have suffered a gradual yet continuous loss of calibre throughout the human period. Among various causes which have contributed to this effect it must not be forgotten that, with advancing civilisation, the conditions to which such weapons owe their origin must inevitably cease to exist. Carnivores, great and small, are slowly but surely disappearing in their unequal struggle with new masters of the world; and the cranial armature of ruminants, which proved a solid defence against teeth and claws at close quarters, avails nothing against more cunning foes who fight with missile weapons, whether flint, spear, or bullet. Horns and antlers have declined with the declining influence of natural selection, and illustrate the fundamental truth that "not only does the survival of the fittest select the best, but it also maintains it" (Weismann), the most elaborately adjusted adaptation being "handed over to a process of gradual destruction the moment it ceases to be essential to the life of the species."

(To be continued.)

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* The predilection of the Puma for horseflesh leads Mr. Hudson to suggest that the indigenous horses of America were exterminated by Pumas ('Naturalist in La Plata,' p. 33).

THE FAUNA OF LINCOLNSHIRE.

[In an Address to the Lincolnshire Naturalists' Union, delivered at Lincoln on May 31st last, Mr. John Cordeaux, as President of the Union, made some instructive observations on the faunal areas of Lincolnshire, and on the best mode of utilising the materials which exist for elucidating the Natural History of the county. As those remarks will doubtless interest many besides those to whom they were originally addressed, we give the following abstract, omitting such observations as were of purely personal or local application.—Ed.]

Lincolnshire is the second largest county in England, its total length being seventy-five miles by forty-eight in breadth, and containing 1,777,879 acres, 85 per cent. under cultivation. The surface presents a very considerable diversity of character, sea-coast, marsh, wold, moor, heath, and fen, and some very considerable woodlands with much pleasant and typical scenery, without anywhere rising into the grand and strikingly picturesque.

The county is not readily divided into what are called "faunal areas"—that is, districts more or less compact, with well-defined boundaries, between which—one or the other—faunal distinctions can be clearly established. In taking a general survey of the whole area it appears capable of being irregularly divided into at least six fairly marked districts; these are—

I. The Marsh and Middle Marsh—which is the whole of the great alluvial flat which lies between the east coast and the foot of the chalk wolds, as far as Spilsby.

II. The Fens—south of Spilsby and Wainfleet and east of Billinghay, Heckington, Bourn, and Market Deeping, with a branch extending westward of the Witham to Lincoln.

III. The Chalk Wolds.

IV. The Heath—an irregular district, partly on the oolite and partly on the lias, and not easily defined. In its more southern portion it is split into two arms by the Witham valley. It runs from S.E. to N.W., and includes the heaths near Woodhall Spa, the moorland near Market Rasen and below Caistor, and the commons and rabbit-warrens between Gainsborough and Frodingham, in the north-west of the county.

V. A portion of Kesteven, south of Grantham, and east of Belvoir, of which Corby is about the centre, well wooded, picturesque, and highly cultivated, and containing noble parks and country seats.

VI. The Isle of Axholme, formerly moor, bog, and widely-extending heath and low firwood, but now 50,000 acres of rich warp, and bounded to the north-west by the great level of Thorne waste in Yorkshire.

It must be clearly understood, however, that these divisions are only approximate, and that with our present knowledge no absolutely hard and fast lines can be laid down defining faunal areas, and that there are yet portions of the county which it is difficult to range under any of these divisions.

In the Marsh and Middle Marsh is included the whole of the low-lying plain between the foot of the chalk wolds and the sea, including the sea-coast itself and all its wide attractions. The chief interest of this district rests in its Ornithology—more particularly in the spring and autumn—and in connection with the migration of birds. The total number of species which can fairly be admitted at the present time into the Lincolnshire avi-fauna is somewhat doubtful. In the Humber district, up to this date, I have been able to record 290. This compares favourably with the Norfolk list of 293, and Yorkshire with 310. With our present knowledge as to the frequency with which rare birds turn up during the period of migration, far out of their ordinary route, I think we should attach very little importance to the increase of any local or county list by the addition of mere wanderers. The record of such is interesting as showing how far some birds get driven out of their normal course. The chief additions to the Humber district in late years have come from Spurn, but there is no reason why equally good results should not be obtained from our own coast.

The collection of facts in connection with the Botany of this district commenced as far back as 1590, and the great naturalists of former days—Gerard, Ray, Sir Joseph Banks, and Dr. Martin Lister—have each in turn visited and investigated its floral treasures.

As regards the Marine Mammalia (the Seals, and various forms of Whale, Grampus, Porpoise, and Dolphin), although in recent years considerable additions have been made to our local

list, we still require further knowledge and more scientific investigations. The capture of a Seal or the stranding of a Whale—and such occurrences are by no means unfrequent—should at once be noted, and an examination carried out on the spot, careful notes and measurements made, the skull, at least, preserved, and where possible a photograph taken before the carcase is removed.

There is no other faunal area in Lincolnshire where the old glories have so entirely vanished as in the fenland, formerly a vast level of peat-moor, morass and bog, with league beyond league of shallow mere, interspersed with a vast growth of reed and bull-rush and various water-loving plants, and on the drier portion deep sedge and doubtless some rich pasturage, with thicket of sallow, willow, birch, and sweet-gale, which before the dawn of history had usurped the place of oak, Scotch fir, and yew. The whole of this vast level was a paradise for wild creatures, beast, bird, and fish; and predominate over all, upon the peat-stained waters of the shallow lagoons floated primitive man in a canoe dug out from a single tree, and using weapons tipped with fractured flint or fish-bone.

Of the natural treasures of the old fenland we have but scant record. Unfortunately our forefathers, when they did write, cared little for depicting their natural every-day surroundings, yet we must be thankful for the few precious records which have come down to us of those olden times, and enable us to form some idea of the extreme richness of the Fen fauna and flora, from the 'Liber Eliensis'; the Chronicles of Crowland; and the writings of William of Malmsbury, Thomas Fuller, Camden's 'Britannia,' and the naturalists Pennant, Ray, and Montagu; also the quaint verses left by Michael Drayton in his 'Polyolbion,' and by "Antiquary Hall," of Llyn, in the doggerel rhymes depicting a fenman's daily life.

One aim of our Society should be the collection of any scrap, oral or written, in connection with physical-archæology, and any who have opportunities of inspecting old deeds, letters, and family account-books, will do good service by extracting any small matter which directly or indirectly bears on this subject. Such entries were, no doubt, considered most trivial by the original writers, but in the light of the present day they are of much interest and importance. To cite one or two instances alone, how little

historical record is left of the Great Bustard in Lincolnshire. The late Sir Charles Anderson, of Lea, in 1874, sent me the following extracts from an old account-book kept by Charles Anderson, at Broughton, near Brigg, from 1669 to 1673:—

1670, September 26. To John Hall, brought Curlew . . . . 1s.
„ October 23. Item to Thos. Beckett for killing two Bustards 2s.

Then there is the letter from the great Dr. Johnson, dated January 9th, 1753, to his friend Bennet Langton, of Langton, acknowledging the receiving a parcel of game, amongst other things a Bustard, which he gave to Dr. Lawrence.*

A letter written to myself by the Rev. Edward Elmhirst, November 29th, 1886, containing personal recollections of Lincolnshire ornithology, also his communication made to 'The Field,' Nov. 27th, 1886, concerning the former nesting of Hen Harriers in the moors near Market Rasen, are amongst the most valuable contributions to the records of county natural history in recent years.

Of infinite interest also, as throwing light on the past, would be the account-books and records of captures made in the duck-decoys at one period so common in the marsh and fen. We have never met with more than one decoy-book in Lincolnshire, namely, the well-kept register of the Ashby Decoy, near Brigg, worked successfully for so many years by Captain Healey.

So marvellously abundant were wildfowl before the fens were drained, that we are told a flock of wild ducks has been observed passing along the north and north-east into the east fen in a continuous stream for eight hours together.

Our next faunal area is very distinct and well marked—the Chalk Wolds—in its greatest length, from Barton-on-Humber to Burgh, fifty-two miles, and the greatest breadth, near Market Rasen, fourteen miles; the highest point of the range, 549 ft., is near Normanby Clump, and this is the highest land in the county. Before the general enclosure, at the commencement of the present century, the wold was a wild and open region, a rolling upland, more or less intersected by deep valleys. These rounded hills were covered with heather and heaths, coarse rough grasses, like the barren brome, and *Aria cæspitosa*, the turfy hair-grass, the most graceful if the most useless of all, with thousands of acres together

* This letter will be found quoted in 'The Zoologist' for 1879, p. 340.—Ed.

of gorse, and ancient thorns in clumps and single. It was a district most admirably fitted to the habits of that noble bird the Great Bustard, and the Stone Curlew, the former probably almost extinct before the commencement of the century, the latter still holding its own—a few pair nesting annually, though not now on the wold.

The two distinct ranges of chalk and oolite which run from south to north of the county form elevated tracts, which in their original condition were heath and moorland, and almost destitute of timber trees. Along the flanks of these hills and in the intervening low country stretched the deep forests of Kesteven and Lindsey,—the Bruneswald,—oak, ash, elm, beech, fir, holly, yew, and hazel, sufficient remains existing in some of our oldest woodlands to recall the ancient glories of the land. No better "happy hunting grounds" remain to reward the naturalist than these comparatively undisturbed areas. Here in 1884 an example of the old British Wild Cat (*Felis catus*) was taken,* and the Pine Marten (*Martes abietum*) can scarcely yet be extinct; bones of Red Deer (*Bos longifrons*), Wolf, Wild Boar, and Beavers have been found in the becks. We have as yet no list of Lincolnshire mammals, and I shall be greatly indebted to any of our members who will enable me to complete a list, which is already partially prepared, with notes from their respective districts.

The heath is another most charming faunal area, from the fact that some few scattered portions are still in their primitive condition, as in the neighbourhood of Woodhall Spa and the warrens and commons of Scotton, Manton, Twigmoor, Crosby, and Brumby in the north-east. The Ermin-street, that great military highway of the Romans, which passed through the gates of their chief fortress, Lincoln, followed the ridge of the oolite from south to north—to east and west of this was a wide, open, and continuous stretch of elevated tableland, the roads running through leagues of purple heather where the pink and purple shading of the common and cross-leaved heaths intermingled with the yellow blooms of the petty whin and sheets of pale blue harebell, and the darker blue gentian (*Gentiana pneumonanthe*). A glorious land it was to cross in those days, the long, lone, level line of a well-kept war-path stretching like a ribbon over the heath, and marked at short intervals with high stones or posts as a

* See 'The Zoologist,' 1884, p. 380.

guiding line in fog and snow, in a solitude but rarely broken. except by the footfall of the legionaries and the dismal creakings of the baggage-train and provision carts, and above under the blue heaven carolled the Lark as now, and the plaint of the Golden Plover sounded sweet from off the moorlands.

The north-east corner of Lincolnshire, notwithstanding recent changes and trade encroachments, is still rich in animal and plant life, and presents a wide field for future research. Further westward, and beyond the Trent, lies the Isle of Axholme; some portion, adjoining the great Chase of Hatfield and Lindholme, in Yorkshire, was once the hunting-ground of English kings. We must turn to the pages of historians, as Leland, De-la-Pryme, Dr. Stonehouse, and others, if we wish to learn its ancient condition before the enterprise of the Dutchman Vermuyden transformed its wastes and swamps and demon-haunted solitudes into fertile lanes and at the same time banished its indigenous flora and fauna. In fact, the entire district, including Thorne waste, beyond our border, and portions also east of Trent, resembled the "tundras" of Lapland and Northern Asia, and, like these, were the breeding-homes of innumerable wildfowl and waders. Most suggestive of a not remote Arctic character are the lingering of such plants as *Selaginella selaginoides*, *Lycopodium alpinum*, recently discovered by the Rev. W. Fowler, also *Andromeda polifolia*, and *Empetrum nigrum*, on Thorne waste, *Myrica gale*, generally, and the impressions of leaves of some Arctic willow in the laminated silts and peaty alluviums.

Of our sixth district, that south of Grantham and east of Belvoir, I can tell you little, for, excepting in passing through by rail, it is a *terra incognita* to me. The chief attraction is Grimsthorpe Park, which contains many fine oaks, hornbeams, and hawthorns, and a small herd of Red Deer—interesting as the only one left in the county, and descendants of those indigenous deer which at one period wandered wild, free, and unrestricted through the length and breadth of the land.

In our investigation into the natural history of this county, we must remember that at no very distant period Lincolnshire was part of the mainland of Europe, and there was no North Sea as we know it now, and we must therefore expect to find close affinity between the fauna and flora on both sides of the water. Once, no doubt, a great central river, whose debouchure was over

the Dogger Bank, received the waters of the rivers from each side. The North Sea, if you will take the trouble to look at Mr. Olsen's map, is little more than a great plain covered by shallow water; off the north-east coast of England it is twenty fathoms, and as we go south even this depth is exceptional. The North Sea contains some remarkable depressions, one of which, the Silver Pit, is a narrow submarine valley fifty fathoms in depth, forty miles off the north-east coast of Lincolnshire. The intrusion of this great water, the North Sea, between ourselves and the continent may have been very rapid, for when the chalk barrier, which presumably at one time extended eastward from Flamborough Head (cropping out again around Heligoland) was once breached and the central river taken in flank, there is no reason why the great level plain of "intermediate" Lincolnshire should not have been submerged in a period even of a few days.

Before closing these remarks,—as we are now engaged in rocking the cradle of the Lincolnshire Naturalists' Union,—I should like to say a few words as to the possibilities of a future, and the taking up of a useful position. There is no other county in England in which the fauna and flora have so greatly altered; large numbers of birds, insects, and plants have been altogether destroyed, or, in the former case, driven away by enclosure and drainage. It becomes therefore an imperative duty to use our best endeavours to preserve what is left, and to take care that our scarcer mammals, nesting birds, and surviving plants are not ruthlessly destroyed nor unnecessarily banished.

NOTES AND QUERIES.

Memorial to Gilbert White.—The new water supply for the village of Selborne, which has been given to the inhabitants as a memorial to Gilbert White (Zool. 1893, pp. 201, 290), was made free for public use on June 8th, the inaugural ceremony being performed by Lady Sophia Palmer, daughter of the Earl of Selborne. Hitherto the inhabitants have been compelled to obtain their water at a fountain situated at the spring-head, and in some cases a quarter of a mile had to be traversed to obtain a bucketful. About £250 was raised by subscriptions, and by means of a hydraulic ram at the spring-head the water is now forced into a reservoir erected eighty feet above the level of the village, and by means of gravitation

the water is circulated through the mains, which are laid in the principal streets. At certain spots taps are placed along the streets, at which the people can obtain the water. Lady Sophia Palmer, accompanied by Lord Selborne, arrived at the village in the afternoon, and having been presented with a bouquet, pressed a lever, by means of which the ram was set in motion. Her ladyship subsequently proceeded to the village, and drew the first bucket of water. Lord Selborne, in the course of a brief speech, said the villagers should congratulate themselves upon having a good water supply, which was a useful and valuable gift. Water was one of the most excellent of God's gifts to man. Referring to the difficulties which the people had heretofore experienced on this score, he remarked that if Gilbert White had been asked what sort of memorial should be erected he would doubtless have chosen the most useful and the most unpretentious. The one they had provided would be the one he would probably have liked best.

MAMMALIA.

The Indian Antelope: period of Gestation.—At a meeting of the Zoological Society, held on June 5th, Sir Edmund Loder made some remarks upon the period of gestation in the Indian Antelope, based upon observations made upon a small herd of those animals in his own park in Sussex. Three does had produced fawns twice in the year, and the period of gestation was stated to be five months. The importance of these observations may be inferred from the fact that none of the authorities on Indian Mammalia have published any statistics on the subject. Jerdon, in his 'Mammals of India' (p. 277), quoting Elliot, states that "the rutting season commences about February or March, but fawns are seen of all ages at every season," and this statement has been copied by subsequent writers. When statistics in regard to other species can be otained, it will probably be found that in the smaller Antelopes the period of gestation is the same as with the sheep, five months, and not eight, as in the case of the Cervidæ.—J. E. Harting.

The Squirrel in the Southern Highlands.—At Glenrazie Woods recently I noticed some Squirrels skipping amongst the trees, and this was an occurrence of more than usual interest to me, as it gave ocular demonstration that these pretty little animals had become established to the westwards of the Cree. When my friend Mr. J. A. Harvie Brown published, in 1881, his 'History of the Squirrel in Scotland,' I was unable to furnish him with any evidence that Squirrels had extended any farther westwards in Galloway than Cumloden Park, where the first one was seen in 1783. In 1892 Sir Herbert Maxwell, writing in the 'Annals of Scottish Natural History,' stated that Squirrels had been seen at Monreith about 1882, but that it was not till 1889 that he had noticed them himself. They soon,

however, became quite abundant. The extension of the species throughout Wigtownshire has, therefore, been very rapid.—R. Service (Maxwelltown, Dumfries).

Homing Instinct in Ferrets.—One of the most familiar attributes of some domestic animals is the faculty of being able to return to their homes over roads of which they could have had no possible previous knowledge. While dogs, cats, and pigeons have perhaps the largest share of the homing faculty, some other of the domesticated animals—black-faced sheep, for instance—are well known to depend on it for occasional and often undesirable returns to their original home. I have just been informed by a gamekeeper of an instance of this homing faculty in one of his Ferrets. It is worth mentioning, because Ferrets are animals that one could hardly suspect of "homing" under any circumstances. This particular Ferret was lost at a distance from home, as the crow flies, of about two miles and a half. To return it must either have taken a much longer and more circuitous route, or else swam across a pretty wide burn. But in less than a week after it was lost the Ferret walked in at the open door of its master's house, looking none the worse for its temporary sojourn in the wilds.—Robert Service (Maxwelltown, Dumfries).

[Other instances of the kind will be found recorded in 'The Field' of Jan. 25th, Feb. 1st and 8th, 1873; Jan. 23rd and 30th, 1886.—Ed.]

Serotine Bat near Hastings.—I am forwarding a Bat obtained last evening (May 29th), which I make out to be the Serotine, *V. serotinus*. Please say if I am correct. It is one of a colony of about twenty established in a house at Guestling, near Hastings. I have watched them emerge about fifteen minutes past sunset, going off in parties of from two or three to seven or eight. They all follow the same line, though not a direct one, to a wood a short distance away, flying high and steadily until reaching it. I obtained another at the same time, also a female, the fur of which is distinctly brighter, and, judging from the more worn appearance of the teeth, is older. This specimen is not hit so hard with the shot, and I am preserving it. It agrees with Bell's measurements except in the expanse of wing; this is exactly 14 inches (before skinning).—H. G. Jeffery (George Street, Hastings).

[The Bat sent is the Serotine, recognizable by its narrower wings, longer and narrower tragus than the Noctule, and with two premolars less in the upper jaw.—Ed.]

BIRDS.

The present Status of the Hooded Crow in Southern Scotland.—Mr. A. C. Chapman's note on the nesting of the Hooded Crow, *Corvus cornix*, in Northumberland (p. 227), is, I think, of more importance than he seems inclined to attach to it. Although nesting exceptionally much

further south than the locality given—*e. g.* in Yorkshire (Clarke and Roebuck), and in Essex (Miller Christy),—still its breeding in the eastern counties (at any rate, anywhere south of Perth, Forfar, and Kincardine) must be considered sporadic and exceptional. The latest book on breeding areas of British Birds ('Nests and Eggs of British Birds,' by C. Dixon) is in regard to this bird misleading; for under the heading *Corvus corone*, the writer says (p. 3):—"In Ireland it is rare and almost replaced by its close ally the Hooded Crow; the same remarks apply to Scotland, although it is not so scarce." Now, far from being scarce, it is quite a common bird in all the southern Scottish counties with which I am acquainted—Fife, Edinburgh, Linlithgow, Haddington, Peebles, and Northern Dumfries—while the Hooded Crow is merely occasional and sporadic. It is a curious fact, and one that almost leads to the idea that the black Crow is pushing northwards, and that the real Hooded Crow was once the prevalent form in the Scottish lowlands, that by gamekeepers, shepherds, and country people generally in that district the black Crow, *Corvus corone* is invariably called a "Hoodie." It used to puzzle me a good deal when at school in Fife, where several score of Hoodies' eggs were annually brought in, to understand why they should be so styled, seeing that no vestige of a hood was visible on any of the birds that laid the eggs. I have seen hybrids killed at the nest in the county of Edinburgh, but the gamekeeper considered them very uncommon. At an early spring roosting colony of forty or fifty birds, almost within the bounds of the city of Edinburgh, not one of the "Hoodies" was observed to have any grey about it. As regards the west, and especially the N.W. of Scotland, no doubt *Corvus cornix* is the prevalent form, but we have it on the authority of Messrs. Harvie Brown and Buckley ('Fauna of Argyle,' p. 89), that *Corvus corone* is "abundant on parts of the mainland" of Argyle.—Harold Raeburn (31, Clare Road, Halifax).

March Cuckoos.—Nearly fifty years' experience has taught me the unwisdom of dogmatism; far be it from me therefore to assert that Cuckoos have not been heard or seen in this country in March, or any other unaccustomed month. Consequently, when interrogated on the subject, I very guardedly replied, "such a bird as a 'March Cuckoo' has no place in *my* experience," a statement of pure fact; but unfortunately I did not end there, and Mr. Grabham's courteous exposure of the weak spot in my armour is the legitimate result. The Editor has correctly interpreted my meaning (p. 225), but I should like to add that I was quite aware of the very occasional occurrence of birds of this species during summer in the reddish plumage of the first autumn; though as they are excessively rare in this country, it seemed to me hardly worth entertaining the idea that such birds had, on at least several occasions, been detected at a time when even the normal plumaged Cuckoo is not looked for. But perhaps I ought not to have stated that a Cuckoo in immature plumage in March was an

"obvious absurdity," but rather that it was "very remarkable" if true. I was led to the conclusion at which I arrived not alone by the description of the bird's appearance, but also by its flight and actions, which certainly in one of the cases reported this spring indicated the Hawk rather than the Cuckoo. So far as I know, all the rufous coloured adult Cuckoos hitherto met with have been females. May I add that early in last March I heard a Ring Dove—I doubt not a young and inexperienced bird practising its love song for the first time—which so much resembled the cry of the Cuckoo that it might readily have deceived a careless or inexperienced person. May I finish with a story of a Cuckoo written, and evidently credited by, a very "painful" and observant naturalist, a F.R.S., and valued correspondent of Gilbert White, to a lady of rank (in fact quite a high-life story) in the year 1790?—"My very estimable neighbour, Lady Walpole," says the writer, "informed me that her grandfather Hoskins, of Barrow Green, a few miles from Godstone, in Surrey, at Sir W. Hoskins' in the Christmas Holydays, heard a Cuckow singing in a hollow tree laid upon the fire. I am thus particular in the story," he adds, "because it is uncommon."—T. SOUTHWELL (Norwich).

Early Cuckoos in 1894.—Since writing my note on March Cuckoos (p. 190) I received undeniable evidence of the extraordinarily early arrival of the Cuckoo in North Oxon this spring. A neighbour, who is interested in, and has a good knowledge of, birds, heard the Cuckoo's note at Milcombe on April 1st, at about 7.30 a.m.; on the 2nd he saw two of these birds, and on the same day an old farmer heard it at Tadmarton, and remarked truly that it was three weeks or more before its usual time; several labourers heard it also. It was heard here by another farmer on the 5th, and by upwards of a dozen persons on the 8th. I did not happen to hear it myself until the 14th; but had I been at home on the 8th I should certainly have heard it on that day, for the people in the house said a Cuckoo was calling loudly all the morning. One was heard also at Kingham on the 8th. The 14th is six days earlier than I ever heard it before. Is it possible that the Cuckoos were deceived by a remembrance of the fine warm nesting season we had last year into the belief that England really had a summer, and so returned before their usual time? If so, they must indeed have been woefully deceived. For the dreary, dismal May, with little else but cold winds, frosts, and rain, which we have just experienced, seems so far likely to be followed by an equally miserable June.—O. V. APLIN (Bloxham, Oxon).

The following note respecting the early appearance of the Cuckoo in Dumfriesshire may be of interest. On April 15th, while out walking on Lochar Moss, about a mile east of Newfield Farm, I distinctly heard the call of the Cuckoo. I made for the few scattered trees from whence it was evident the sound proceeded, and soon caught sight of the bird perched

upon the projecting branch of an alder. About a minute afterwards it flew from the tree and settled upon the support of a wire fence close by, where it was almost immediately followed by another Cuckoo, which came from an adjoining tree and settled near it on the same fence. I was close enough to observe that both birds were of the ashy-grey colour which denotes the adult bird.—Hugh Mackay (33, King Street, Dumfries).

[Will some of our correspondents state whether in their experience it is a common occurrence, or not, for Cuckoos to call *while on the wing*. An instance of this is reported in the Natural History columns of 'The Field' of the 15th March last as evidence that the observer who stated that he had seen a Cuckoo in March was not mistaken.—Ed.]

Short-eared Owls in Solway.—On May 24th I once more spent another long day in rambling through a corner of that delightful region of Galloway known as the Southern Highlands, a country not yet known to the touring public, and that has been but casually investigated by a few field naturalists, mostly botanists and geologists. Here the last of the southern outposts of the Ptarmigan were occupied till well into the present century; the Golden Eagle nested till far on in the sixties, the Osprey having ceased to breed here only a few years sooner. The Peregrine and the Buzzard still frequent its precipices, and the Dotterel nests annually on its mountain shoulders, while round the margins of its tarns and lochs the Dunlin breeds in numbers, and the young of the Greenshank have been seen. The district is not likely to remain much longer a *terra incognita*, for in Mr. Crockett's very popular novel of 'The Raiders' most of the scenes are laid within its picturesque bounds, which bids fair to send a crowd of tourists into new haunts. But I am getting quite away from the subject of my note. Between lochs Trool and Dee we noted at least four pairs of Short-eared Owls on the wing, quartering the ground in the manner which their recent great immigration has made familiar. Eastwards of loch Dee a solitary individual of this species was fiercely assailed by a pair of Carrion Crows, which were flying alternately at it. We watched the fight for a long time, during which the Owl acted strictly on the defensive, but apparently tiring of that game, it sought to escape its assailants by a circling upward flight, and the three were finally completely lost to sight high above the summit of Meikle Millyea. The pair of corbies returned to their nest in about ten minutes in a particularly vociferous mood. During our ramble of some seventeen miles neither my companion nor I ever saw a single Vole, and none of their workings that could be said to be quite recent. It is rather singular to find even this small number of Short-eared Owls still there, when they have disappeared, along with the voles, over the remainder of the great extent of country that was under the domination of the plague. On the sheep farms of the Galloway hills the voles found their western limit as a plague, and they were a year or two later than elsewhere

in reaching a predominant abundance. At no time did these lands present the same bare, verdureless, wind-blown aspect as did the Dumfriesshire uplands. Very possibly the Short-eared Owls referred to may have remained to prey upon a vole colony that still exists somewhere amongst the glens betwixt Trool and Dee. — Robert Service (Maxwelltown, Dumfries).

Great Northern Diver choked by a Gurnard.—Early in April a Great Northern Diver, *Colymbus glacialis*, was picked up on the shore opposite Orchardton by one of the keepers there, and Mr. Robinson Douglas informs me that on examination it was ascertained that it had been choked by a Grey Gurnard, *Trigla gurnardus*, which was still sticking in the bird's gullet.—Robert Service (Maxwelltown, Dumfries).

[We have not unfrequently met with instances in which Kingfishers and Little Grebes have been choked in their endeavour to swallow the River Bull-head or "Miller's-thumb," *Cottus gobio*, but we never heard of a Cormorant being choked by a fish, nor have we before heard of such an accident happening to a *Colymbus*. The gullet in these birds is so dilatable that such a mischance probably happens but rarely. In the instance now reported the long humeral and opercular spines of the fish, and the strong and rough dorsal fin-rays (the second of which exceeds in length the depth of the body beneath), no doubt caused the terrible struggle which ended fatally to both bird and fish.—Ed.]

Lesser Redpoll breeding in Somersetshire.—I notice your remark (p. 228) with regard to the Lesser Redpoll. I thought mine was the first instance known of this bird nesting in Somerset, but in the 'Proceedings' of the Somersetshire Archæological and Natural History Society for 1893, which I have since seen, I find that the Rev. Murray A. Mathew, in his "Revised List of the Birds of Somerset," remarks that it is a resident in limited numbers, that he has seen it in the summer time near Frome, and once had a brood of young birds in his garden at Buckland Dinham.—H. St. B. Goldsmith (King Square, Bridgwater).

Lesser Redpoll breeding in Somerset. — I have read with much pleasure Mr. Goldsmith's remarks (p. 228) on the nesting of the Lesser Redpoll in Somerset, and send you some notes I have collected on this subject. I found a nest of this species in the Lansdown district, Bath, on May 6th, 1893. It contained four eggs, and was placed about eight feet from the ground, on the end of a fir-bough. The old bird (the only one visible) flew round in a state of great excitement, calling continuously. Having written to the Rev. R. Chichester, of Prior Park College, Bath, for information about the nesting of the Lesser Redpoll in the district, he replied :—"Until this season I had no idea the Redpoll (*L. rufescens*) built here. I have found two nests, one on May 14th, the other on May 21st.

The first was in an apple-tree in an orchard between Coombe Down and Midford, at a distance of ten feet from the ground. The nest was beautifully made of small twigs and sticks, and lined inside with vegetable down as white as snow. It contained four eggs, highly coloured but poorly marked, and quite fresh. The second nest was taken a week later, on the bank of a stream which runs through Midford near Tucking Mill. It was built in a willow-tree overhanging the brook. The nest was composed of twigs, lined with vegetable down, and in this case with plenty of hair. There were five eggs, and incubation had commenced. There were Brown Linnets breeding in each case in close proximity."—C. B. Horsbrugh (4, Richmond Hill, Bath).

Pheasant nesting in a Tree.—With reference to the Pheasant's laying in a nest in a tree near Barnwell, as recorded in a note from Miss F. (*not* T.) Wickham to me, and forwarded, at her request, for the last number of 'The Zoologist' (p. 227), I heard yesterday from Mr. Henry Wickham, of Barnwell Castle, that there were nine eggs in this nest when first found, that three young birds were recently found dead at the foot of the tree in which the nest was situated, and as all the eggs were hatched, it is hoped and believed that the parent bird has taken off the remainder of her brood in safety.—Lilford.

[Instances of Pheasants nesting in trees are not so uncommon as might be supposed. Several such cases are noticed in Mr. Tegetmeier's work on Pheasants (2nd edition, 1881, p. 10), the height from the ground varying from nine to twenty-five feet. In these instances the hen Pheasant had appropriated deserted nests of the Wood Pigeon, Owl, Sparrowhawk, and Squirrel, and in several cases the young of some of them had been brought down in safety, though many had been killed by falling.—Ed.]

Dotterel in Haddingtonshire.—On May 22nd I saw a flock of eight Dotterels, *Endromias morinellus*, at a place called Dirleton, in Haddington. They were feeding on some ploughed land, and I was told that they had been there some days. Is it not rather late, considering the early season, for these birds to be in flocks?—Harry F. Witherby (Musselburgh, N.B.).

Whimbrel in the Midlands.—I have recently seen two Whimbrels which were shot in the north-eastern corner of Buckinghamshire, not far from the river Ouse, in the second week of May—about the 13th—15th. Although the Whimbrel passes (in N.E. and S.W. directions) over the southern Midlands at the periods of migration, and is observed with tolerable regularity while on passage, it very rarely alights in these counties. When it does so it is, I believe, always in spring. At all events, I have no record of the Whimbrel being shot or observed on the ground in Oxfordshire in August or September. This observation holds good of Northampton-

shire also. Lord Lilford writes that although it passes along the Nene valley in considerable numbers on the southern migration, and again in much fewer numbers in May, yet in his experience he never saw a Whimbrel on the ground in Northamptonshire, and he is convinced that on the southern migration they hardly ever alight near Lilford, although he has been assured of a few instances of their doing so in May. The only example actually killed in Northamptonshire which he was able to record was shot at Thorpe Mandeville on May 16th, 1881, as noted by me at the time in the 'Midland Naturalist' (*vide* "Notes on Birds of Northamptonshire," pp. 309, 310). In Mr. Clark-Kennedy's 'Birds of Berkshire and Buckinghamshire,' p. 143, the Whimbrel is referred to as less common than the Curlew, "but occasionally a specimen is killed on the river [Thames] in spring and autumn." A correspondent also informed the author that "a few specimens of the Whimbrel are seen almost every winter [?] on the banks of the reservoirs here." But as no definite instance of the occurrence of the bird is given with locality and date, we may fairly consider that the work quoted does not afford conclusive evidence of the Whimbrel alighting in the southern Midlands on the autumn migration. The only instances of the Whimbrel being seen on the ground, or being shot in Oxfordshire of which I can give exact dates are the following:—Bloxham, April 29th, 1880; Clattercote Reservoir, one seen, May 9th and 10th, 1885; Thame, May 21st, 1886. In April, 1859, one was shot at Wormleighton Reservoir, Warwickshire.—O. V. Aplin (Bloxham, Oxon).

Shag on Somersetshire Coast.—I am enabled to add the Shag (*Phalacrocorax graculus*) to the list of Somersetshire birds. A specimen of this bird was killed between Brean Down and the mouth of the Parrett on October 20th, 1892, and is preserved in the collection of Mr. Tucker, who received it in the flesh from the fisherman who shot it.—H. St. B. Goldsmith (King Square, Bridgwater).

Razorbills and Puffins cast ashore.—In the early part of March last some Razorbills and Puffins, waifs of the sea cast up on the shore, were noticed by the Rev. E. P. Larken about the tide-mark near Boulogne. On the English side of the Channel, at the same time, some Razorbills and a few Guillemots, but no Puffins, were to be seen on the shore in the vicinity of Brighton, starved, as often happens, from a continuance of rough weather, which had driven the fish upon which they subsist too deep down into the sea for diving birds to catch them (*cf.* Proc. Nat. Hist. Soc. Glasgow, vol. i. p. 4). Such birds, if not already dead, are always moribund, and I am given to understand, when taken to the Brighton Aquarium, never recover, or at best live but a very short time. To prosper in an aquarium the *Alcidæ* should be netted, and have live fish to eat, for to give them what is not fresh is at all times dangerous. When I was last at

Brighton, on March 28th, there were two Razorbills in the Aquarium, which had lived there nearly three years. When they dived it could immediately be seen how tightly compressed all the plumage was by the weight of water, the vacuum made by the air in and beneath the feathers encasing the whole body of the bird as in an envelope of silver. As the air streams away, expelled from the Razorbill's tail, it rises in a beautiful network of bubbles to the surface. It is hardly correct to state as some have done that the action of the wing under water is precisely the same as in flight, because it is never fully extended, the beats are not so rapid, and the motion is sustained with labour. Razorbills are probably able to see to a great depth in still water, for when searching for food in their tanks it is to be noted that they merely swim with about half the head immersed, just enough for the eyes to be under the surface and no more.—J. H. Gurney (Keswick, Norwich).

Marsh Harrier nesting in Oxfordshire. — In the interests of the Oxfordshire ornithological record, allow me to say that I hope Mr. Swann, or his informant, will see his way to give us more precise information about the Marsh Harrier breeding in this county (p. 227). Those ornithologists who know Oxfordshire will have read with no little astonishment that this Harrier, hardly known even as an occasional visitor nowadays, should have actually nested so recently as July, 1890. I only know one locality "near Oxford" in the least degree suitable to the requirements of this species. It would be interesting to know the exact locality of the nest; also how many eggs it contained, how they were identified, and what became of the birds. From Mr. Swann's note it appears that his informant, from whom he purchased the egg, was not very clear in his remembrance of the nest. Unless the birds were satisfactorily identified it seems more probable that they were Montagu's Harriers—supposing it to be certain that they were Harriers at all. I hope Mr. Swann will not consider this note as an unduly sceptical one, and will understand that it is written solely in the interest of our county avifaunal history.—O. V. Aplin (Bloxham, Oxon).

Whiskered Tern in Dumfriesshire.—On the 28th May last a male specimen of the Whiskered Tern, *Hydrochelidon hybrida*, was forwarded to me from Friars Carse, with the information that it had been shot on marshy ground near the Carse loch, about eight miles from Dumfries. As I had never seen this bird before, I examined it in the most careful manner, referring occasionally to my books, and comparing it with specimens of the commoner Terns in order to ascertain the precise identity of the bird before sending you this note. Convinced that it was the Whiskered Tern, I gave the bird in the flesh to Mr. Robert Service, of Maxwelltown, Dumfries, for examination, and he agreed in the identification. After skinning it I returned the body to Mr. Service, so that he might examine

the stomach, which he afterwards informed me contained semi-digested portions of the fresh-water shrimp (*Gammarus pulex*). The length of the bird is 11½ in., wing 9 in. Referring to Mr. Saunders' 'Manual of British Birds,' I find that up till 1889 only six specimens have been recorded, four of which were obtained in England, one in the Scilly Islands, and one in Ireland. The last specimen was obtained near Plymouth in 1865, and unless there is a record since 1889, which has escaped me, I presume the specimen now in my possession is only the seventh obtained in the British Islands. It is a new and interesting addition to the Scottish list.—HUGH MACKAY (33, King Street, Dumfries).

Robin nesting in Church.—The following may interest some of your readers. On March 31st, on going to clean the chapel, the woman found on one of the book-ledges a heap of rubbish, evidently brought by a bird; she cleared it away, but on going again the following Saturday, April 7th, found a still larger heap and a perfectly finished Robin's nest. This also, I am sorry to say, was removed; but on hearing of it I had the nest put back in the same place, but without any of the accompanying *débris*. On going to see it this morning I was pleased to find the bird sitting on four eggs. As the nest is not more than one foot from persons in the pew it will be interesting to see whether she continues to sit during service. If she should successfully rear her brood I will let you know, should you care to insert this.—H. W. WYKEHAM (Thame Park, Thame).

Varieties of Rooks.—At Annesley Park there are three rookeries, and during forty years there has never been a variety seen. Last week the shepherd saw what he thought were two white pigeons, but on looking at them more closely a second time he found they were Rooks. He informed the park-keeper, who thereupon shot them. They were strong fliers, in full feather, and as white as snow, with white bills and legs and pink eyes. The owner, Mr. Musters, returned home the same afternoon, and on going to another rookery in the park shot two pied ones, pale yellow and black, with feet and legs mottled. Another has since been seen in a third place. It is very curious that so many varieties should occur at one time in a locality where none had been seen for so many years.—J. WHITAKER (Rainworth, Notts).

Nesting of the Dipper.—I have known the same pair of Dippers (*Cinclus aquaticus*) to build for the last fifteen years under an archway close to my home. There is no mistaking their identity, for when a lad I often used to catch the hen bird, which has only one leg. Their nesting place is well known to boys in the neighbourhood, hence they seldom have the good fortune to get a brood reared and flown. This year I found their nests as follows:—April 11th, nest containing five eggs; 12th, nest and eggs gone; 24th, nest containing five eggs; 30th, nest and eggs gone;

May 10th, nest containing four eggs; 11th, nest and eggs gone; 18th, nest not quite built; 19th, nest pulled out again; 22nd, hole lined thinly with moss and containing one egg; 23rd, egg gone. Thus three complete and two incomplete nests were built this year, and fifteen eggs were laid. It cannot have taken the pair more than six or seven days to build either the second or third nest. The first two nests were built splendidly; the third was built loosely; the fourth and fifth were never finished, although an egg was laid in it. The pilfering of their eggs and the destroying of their nests are repeated year after year, yet I am sure from my own observation that they have never forsaken the place.—John R. Denwood (Kirkgate, Cockermouth).

Variety of Waterhen.—Last summer a keeper told me he had seen a white Waterhen on the lake below the house here, but though a good look-out was kept it was never seen there again. On May 28th I was told there was a curious Waterhen on a pond on the roadside about half-a-mile off. On walking there I saw the bird. The man told me it came there last summer, and was about all the autumn, but left in the winter. It returned about six weeks ago. I got close to it, and found it to be of a pale tawny colour; the back sandy yellow, shot with pale slate and grey, the wings much abraded, with all the finer portions of the feathers worn away; the head pale grey; neck and breast greyish blue. The bird was well grown, and has paired with a hen bird of the normal colour which is now sitting, and I am anxious to see how the young turn out as regards colour. The pond is on the roadside, very bare, no weeds, and only a bit of old hedge at one side. Scores of people pass the edge of it, and dozens of carts every day. There are two small farms within twenty and fifty yards where dogs are kept. Why these birds should have left the larger and quieter pools here, surrounded by covert and abundant food, is a mystery to me.—J. Whitaker (Rainworth, Notts).

FISHES.

Sapphirine Gurnard in the Solway Firth.—I entirely concur in the editorial suggestion that the Sapphirine Gurnard might naturally be expected to occur in the Solway Firth, although this species generally prefers much deeper water than is to be found in the upper parts thereof. But I recorded its occurrence expressly to enable the readers of 'The Zoologist' to add the species to the list of fishes found in our territorial waters as contained in the 'Fauna of Lakeland,' simply because the continued absence of the species from the list might suggest the fallacy that this Gurnard avoided our coasts. I could not include the species in our fish-fauna until I had ocular demonstration of its occurrence. The printer makes me say that the largest fish of this species caught locally weighed 3¾ lbs.; but this is a mistake. What I wrote was that it weighed *seven*

pounds and three-quarters. There is nothing extraordinary about this weight; but it is that of a large hen fish in good condition.—H. A. Macpherson (Carlisle).

VERMES.

A Bifid Worm.—In April last Mr. Gilchrist Clark, of Speddoch, gave me one of those rare abnormalities—a worm with two tails. It had been found amongst some worms kept for angling purposes. The species was the ordinary Brandling, *Lumbricus fœtidus*. Considerably less than a dozen instances of this curious malformation in worms are on record, and it so happens that, including the specimen under notice, no less than four of these have passed through my hands. So many as four having been in the possession of one individual would seem to indicate that this "freak" is not so rare as is generally supposed. I have presented this specimen to the Museum of Science and Art in Edinburgh.—Robert Service (Maxwelltown, Dumfries).

[The Brandling (diminutive of Brand) is so called from its colour. It may be of interest to note here that in many dictionaries Izaak Walton is quoted as the first English writer who mentions the Brandling by this name (1653), but the word occurs in Barker's 'Art of Angling,' 1651.—Ed.]

SCIENTIFIC SOCIETIES.

Linnean Society of London.

June 7th.—Mr. C. B. Clarke, M.A., F.R.S., President, in the chair.

Messrs. W. E. Bailey, F. W. Hildyard, and A. Zietz were elected.

The President nominated as Vice-Presidents for the year Messrs. J. G. Baker, W. Carruthers, and F. Crisp, and Prof. C. Stewart.

Dr. John Lowe communicated the results of observations made by him in Madeira and Teneriffe on the habit in certain insectivorous small birds belonging to the genera *Sylvia*, *Phylloscopus*, and *Parus* (of which specimens were exhibited) of puncturing the calyces of flowers for the purpose of attracting insects on which they feed. An interesting discussion followed, in which the President, Rev. G. Henslow, and others took part.

Mr. Carruthers exhibited a series of photographs of the celebrated Cowthorpe Oak in Yorkshire, taken at long intervals, commencing with a reproduction of Dr. Hunter's engraving of 1776, and made remarks upon the rate of growth and decay, and probable duration of life in this tree.

Mr. Raymund Dowling exhibited and made remarks upon a dwarf Glaucous Pine, and some curiously shaped *Trapa* fruits from Japan.

Mr. Thomas Christy exhibited specimens of two species of *Polygonum* (*P. sachalinense* and *P. cuspidatum*), of value for forage, and pointed out

that the roots of the mature plants, when cut, are in the former species of a whitish colour and in the latter of a bright yellow, enabling the two to be readily distinguished.

A paper was then read by Sir John Lubbock, Bart., M.P., F.R.S., "On Stipules and the Protection of Buds." A discussion followed, in which the Rev. G. Henslow, Mr. A. W. Bennett, Prof. Marshall Ward, and Mr. John Fraser took part.

Before the meeting adjourned, the President announced that a bust of Charles Waterton, the Yorkshire naturalist, and author of 'Wanderings in South America,' had been presented to the Society by the Trustees of the late Mrs. Pitt Byrne (*née* Busk). This bust was executed in 1865 (the year in which he died, at the age of eighty-three), by the late Mr. Waterhouse Hawkins. It is an excellent likeness, and the only bust of him in existence. The only accessible portrait of him is a small engraving by Adlard, which forms a frontispiece to the third volume of the 'Essays on Natural History,' from an original oil painting by Charles W. Peale, made in Philadelphia in 1824, when Waterton was in his forty-second year. A comparison of this portrait with the bust shows a remarkable correspondence, allowing for the forty years which elapsed between the two sittings.

June 21*st*.—Mr. C. B. Clarke, F.R.S., President, in the chair.

Messrs. F. W. Hildyard and H. A. Cummins were admitted, and Mr. W. Gardner was elected a Fellow.

Mr. G. Brebner exhibited and made remarks upon specimens of *Scaphospora speciosa*, Kjellm., a seaweed new to Britain, describing, with the aid of lantern-slides, the structure and mode of fructification in this and other allied Algæ.

Mr. J. R. Jackson exhibited the cone of a stone pine, *Pinus pinea*, Linn., which had been picked up by the Comte de Paris in the Coto del Rey, Seville, and which had sprouted and continued to grow for a month afterwards. This peculiarity, which had been often noticed in the larch, was said to be of rare occurrence in the pine.

Mr. Thomas Christy exhibited and made remarks upon a small-berried coffee-plant from Inhanbane, East Africa, somewhat similar to a variety from Sierra Leone and other parts of the West Coast. It was said to be valued for its fine aromatic bitter taste which made it useful for flavouring beans and other material ground up and sold as coffee.

Mr. A. B. Rendle gave an abstract of a paper upon a collection of plants from East Equatorial Africa, brought home by Dr. J. W. Gregory and Rev. H. Taylor, amongst which were several new species.

A paper followed, by the President, "On Tabulation Areas," in which the views of Dr. A. R. Wallace and others on geographical distribution were discussed, and the best mode of tabulating results considered. After some discussion, the meeting adjourned to November 1st.

Zoological Society of London.

June 5th.—Sir W. H. Flower, K.C.B., LL.D., F.R.S., President, in the chair.

The Secretary read a report on the additions that had been made to the Society's Menagerie during the month of May, and made some remarks on the chief animals which he had observed during a recent visit to the Zoological Gardens of Rotterdam, Amsterdam, Hanover, Berlin, and Hamburg.

A communication was read from Dr. E. A. Goeldi, containing critical remarks on the Opossums of the Serra dos Orgaos, Rio de Janeiro, Brazil.

Mr. O. Thomas gave an account of the Gazelles of Algeria, chiefly based on specimens brought home by Sir Edmund Loder, and distinguished three species, *Gazella dorcas*, *G. cuvieri*, and *G. loderi*, the last being a new species of which examples had been obtained by Sir Edmund Loder in the sand-hills three days south of Biskra. A fourth Gazelle, of which a skin and skull had been bought by Sir Edmund Loder in Algiers many years ago, was referred with some doubt to *Gazella corinna*, the Corinne of Buffon.

Sir Edmund Loder then gave an account of his expedition in search of *Gazella loderi*, called by the Arabs "Reem," and stated what he had learnt of its habits and distribution. He concluded with some remarks on the period of gestation in the Indian Antelope, as observed in captivity, from which it appeared that this animal produces young twice a year, and that the period of gestation is five months.

Prof. Howes communicated some notes by Dr. W. R. Benham on a particularly abnormal vertebral column of the Bull-frog, *Rana mugiens*, and on certain variations in the anurous column of this frog.

Mr. Lindsay Johnson read a communication on the form of the pupil in the *Felidæ*, and stated that, after an examination of the eyes of 180 domestic cats, as well as the eyes of all the species of *Felidæ* in the Society's Gardens, he had come to the conclusion that the natural shape of the pupil in *Felis* is circular. Although under various degrees of light he found every shape from the circle through all degrees of oval to a perfectly vertical line, yet instillations of atropine or cocaine solutions caused every pupil to become a true circle. The younger the cat the greater the tendency in the pupil to become pointed oval in ordinary light, and, conversely, the older the cat the more frequently is the pupil circular. Brilliant light always caused contraction to oval, and direct sunlight to a thin line in the smaller *Felidæ*; in the larger species, Mr. Johnson had frequently found the pupils contract to a small circle. Suddenly alarming a cat had the effect of momentarily dilating the pupil; while in sleep the pupil was always contracted. This communication was illustrated by models and diagrams.—P. L. Sclater, *Secretary.*

Entomological Society of London.

June 6th, 1894.—Henry John Elwes, F.L.S., President, in the chair.

Dr. K. Jordan, of "The Museum," Tring, and the Hon. Nathaniel C. Rothschild, of Tring Park, Tring, were elected Fellows of the Society.

Mr. W. F. H. Blandford exhibited a series of eleven male specimens of *Rhina barbirostris* from British Honduras, of which the largest and smallest examples measure respectively 60 and 17 mm. The difference in bulk, supposing the proportions to be identical, is as 43 to 1. He remarked that this variation of the size is especially common in the *Brenthidæ*, *Cossonidæ*, and other wood-boring Coleoptera.

Mr. A. J. Chitty exhibited specimens of *Cardiophorus equiseti* taken near Braunton, on the north coast of Devon, in May, 1891.

Mr. McLachlan exhibited for Mr. J. W. Douglas male specimens of a Coccid (*Lecanium prunastri*), bred from scales attached to shoots of blackthorn (*Prunus spinosa*) received from Herr Karel Sulç, of Prague, and stated that the species was common on blackthorn in France and Germany, and should be found in Britain.

Lord Walsingham exhibited a series of *Cacoecia podana*, Scop., reared from larvæ feeding on *Lapageria* and palms in Messrs. Veitch's conservatories, Chelsea, including some melanic varieties. The Honble. Walter Rothschild stated that he had taken the species on lime.

Mr. C. Fenn exhibited a series of *Selenia lunaria*, bred from one batch of eggs, which included both the spring and summer forms; and also two unforced specimens, which emerged in November. He observed that the variation between the two emergences, *viz.*, spring and summer, is considerable, and also the range of variation *inter se*, especially in the spring form; but it is remarkable that the summer form has one or two representatives among those of the spring emergence. The parent female was taken at Bexley in May, 1893.

Mr. F. Lovell Keays exhibited a variety of *L. alexis* (female), having the marginal ocelli on the hind wings without the usual orange-coloured lunules. The specimen was captured at Caterham on May 22nd, 1894, and was the first example of the species observed by the captor this season.

Mr. J. H. Durrant exhibited a series of *Steganoptycha pygmæana*, Hb., taken at Merton, Norfolk, between the 25th March and the middle of April last.

Mr. H. Goss read an extract from a report from Mr. J. R. Preece, H.M. Consul at Ispahan, to the Foreign Office, on the subject of damage caused to the wheat crop in the district of Rafsinjan by an insect which was called "Sen" by the natives, and which he described as "like a flying bug, reddish olive in colour, with heavy broad shoulders." Dr. Sharp said that in the absence of a specimen it was impossible to express an opinion as to the species.

The Rev. Canon Fowler exhibited for Miss Ormerod specimens of *Diloboderus abderus*, Sturm, *Eucranium arachnoides*, Brull., and *Megathopa violacea*, Blanch., which she had received from the La Plata district of the Argentine Territories, where they were said to be damaging the grass crops.

Mr. Hampson raised an important point as to what was the legal "date of publication" of Part I. of the Transactions of the Society, 1894. He pointed out that the question of the priority of the names of certain new species therein described would depend upon the date of publication. Upon this a long discussion ensued.

Professor Franz Klapálek, of Prague, communicated a paper entitled "Descriptions of a new species of *Raphidia*, L., and of three new species of Trichoptera from the Balkan Peninsula, with critical remarks on *Panorpa gibberosa*, McLach."

Lord Walsingham then took the chair, and a Special General Meeting, convened under Chap. XVIII. of the Bye-Laws, was held.—H. Goss & W. W. Fowler, *Hon. Secs.*

NOTICES OF NEW BOOKS.

Five Months' Sport in Somali-land. By Lord Wolverton. With illustrations from photographs by Colonel Paget. 8vo, pp. 108. London: Chapman & Hall. 1894.

Another book on African big-game, the scene of adventure this time being in Somali-land. In November, 1892, Lord Wolverton and Colonel Arthur Paget, with Mr. Vine as cartographer, made their way to Aden, and proceeding thence to Berbera, purchased camels for transport of their food, water and ammunition, and journeyed some 250 miles southward as far as Galadi and Barri, on the River Shebeyli. The expedition occupied five months, and in the volume now before us (the thinnest ever published on African sport and travel), Lord Wolverton has jotted down the most noteworthy adventures of the party, which his brother sportsman has helped to illustrate.

The travellers were evidently not much impressed with the resources of Somali-land, which depend first on the Goats, which make very good skins; secondly, on the herds which will *in the future* supply food; and thirdly, on Ostrich feathers, and gum which is said to be of a superior quality. The only indication of mineral wealth was furnished by the compasses which, when

placed upon the ground in certain localities, indicated by their oscillations the presence of iron ore.

Apropos to compasses, it was curious to notice how the natives were entirely independent of such instruments. Asked to point in the direction of Berbera, Zeilah, or other places of importance, they did so, and were invariably right. Their power also of finding the way, even to a quarter of a mile of the line of march, was wonderful. Being out one day on the fresh track of a Rhinoceros, and following it for four hours in what the author had imagined to be a contrary direction to that in which the caravan was moving, he was surprised, when giving up a hopeless stern chase, to find from his *shikari* that he was quite close to camp. The sense of smell too in these untutored savages must be very extraordinary. On one occasion the *shikari* scented a wood fire at the camp, which was two miles distant, and by going straight to it saved the author and his companions (who thought the camp lay in another direction) much time and unnecessary fatigue.

The chief feature of the expedition seems to have been the number of Lions met with. Sixteen were killed in the five months, and of these five were shot in six days.

It is to be regretted that there was no naturalist of the party, for an opportunity was thus lost of making some addition to our knowledge of the fauna of Somali-land. The author writes of shooting "Partridges" and "Pheasants" when he means Sand-grouse and Francolin; refers to varieties when he means species; and employs the Latin specific names as if they were native names. Thus he mentions (p. 55), "Shooting as we marched a considerable number of sœmmeringi (*sic*), a species of Gazelle which lives on the open plains"; why not have said "a number of Soemmering's Gazelle"? This species, of which a figure is given on p. 56, is lettered "Owl, or sœmmeringi Gazelle," instead of "Aoul, *Gazella Soemerringi*." Further on allusion is made to the shooting of a "Giranook Owl," a phonetic rendering of two Somali names, which is misleading. From the figure of the "Giranook Gazelle," which is given on page 96, it appears that the species is Waller's Gazelle, of which the Somali name is "gerenook." Nor does the author distinguish the two species of Koodoo, *Strepsiceros kudu* and *Strepsiceros imberbis*. The only measurements given of Antelope horns are those of two pairs of

Oryx horns, which were respectively 32 and 34 inches in length; but these are only average specimens compared with some that have been procured in Somali-land, the longest on record measuring 39 inches. A recumbent figure of Grevy's Zebra, of which seven were shot, is given on page 91, but is unfortunately lettered "Zebra grevu." The "four big Geese," one of which was shot (p. 87), were not identified; nor is the big fish named which was caught with hook and line, and weighed 20 lbs. (p. 84). A large Snake, called *abassa* by the natives, stated to be poisonous, and said to be new to the British Museum collection, is not named, and as neither measurements nor description are given, the reader is left altogether in doubt concerning its identification.

The author would have done well to have had these points cleared up before publishing his narrative, which, as it stands, is a mere record of shooting, and adds nothing to what was previously known concerning the natural history of the country traversed.

The Hawks and Owls of the United States in their relation to Agriculture. Prepared under the direction of Dr. Hart Merriam by A. K. Fisher. U. S. Department of Agriculture. Bulletin No. 3. 8vo, pp. 210. With 26 coloured plates.

Amongst the many useful volumes issued by the United States Department of Agriculture, and distributed so liberally on both sides of the Atlantic, we have seen none more attractive than that with the above title. It is brimful of facts, and illustrated in a way that will make it extremely useful to those for whom it is primarily intended, the object being to show that birds of prey, commonly looked upon as enemies to the farmer, and indiscriminately destroyed whenever occasion offers, really rank among his best friends, and, with few exceptions, should be protected.

The statistics here published concerning the food of Hawks and Owls in America are derived from the critical examination by scientific experts of the actual contents of about 2700 stomachs of these birds, and may therefore be fairly regarded as a reliable exposition of the natural food of each species.

Dr. Hart Merriam remarks that of the seventy-three species

and subspecies dealt with in this volume, only six are really injurious by reason of their destruction of game, poultry, and pigeons, and of these the two chief offenders are the Sharp-shinned Hawk (*Accipiter velox*), which is very like our Sparrow-hawk (*Accipiter nisus*), and Cooper's Hawk (*Accipiter Cooperi*), a larger and more powerful bird of the same genus. But even these two have some redeeming quality, for they have learnt that the English Sparrow is not only an acceptable article of food, but is also readily procurable. Consequently of late years these Hawks have been much more common during the winter months in the larger parks of cities where Sparrows abound.

The actual number of specimens examined was 2690. Of these 169 contained the remains of poultry and game birds; 463 of other birds; 966 of mice; 397 of other mammals, and 623 of insects. Omitting the half dozen species above referred to, the total number of specimens amounted to 2212. Of these 78, or 3½ per cent., contained the remains of poultry or game; 257, or 11 per cent., of other birds; 945, or 42½ per cent., of mice; 309, or 14 per cent., of other mammals; and 599, or 27 per cent., of insects.

The useful information contained in this volume does not end here. As it is intended to be of practical benefit to agriculturists, short descriptions are given of all the species of Hawks and Owls known to inhabit the United States, together with their respective measurements, so that with this aid, and the coloured figures of six and twenty of the more notable species, there ought to be no difficulty in distinguishing friends from foes. For the benefit of those whose interest in the subject extends beyond its economic side, a short account of each species is also given with particulars as to its characteristic habits and nesting. The volume accordingly is one of very general interest, and the excellent coloured plates by Mr. Ridgway add considerably to its value.

Ornithology in relation to Agriculture and Horticulture. By various writers. Edited by JOHN WATSON. Post 8vo, pp. i—viii; 1—220. London: W. H. Allen & Co.

WHILST naturalists in America have been busy collecting facts under this heading, observers in this country have not been

behindhand in contributing to the general literature of the subject. In the little volume with the above title we have a series of essays not only on Hawks and Owls, but also on Rooks, Crows, Wood Pigeons, Starlings, Sparrows, and other small birds, as well as on the Pheasant, Partridge, and Grouse.

We cannot say that this collection is particularly well edited, either as regards arrangement of material, or editorial notes, which in the entire volume do not amount to more than half a dozen in number; but we have at all events an expression of views from such good observers as Miss Ormerod, Messrs. Aplin, Gurney, Nelson, Southwell, Tuck, and other contributors to this Journal, all of whose essays contain useful and reliable information. Several of the articles appear to have been previously published in various periodicals, which causes certain statements to appear somewhat out of date, and the editor would have done well to have indicated when and where they originally appeared.

The Birds of Staffordshire: with illustrations of local Bird-haunts. By Alexander McAldowie, M.D., Vice-President of the North Staffordshire Naturalists' Field Club. 8vo, pp. 150. Printed for Private Distribution. 1893.

Dr. McAldowie has rendered good service to Ornithology by printing these collected observations on the birds of a county concerning which we have had no comprehensive work since the appearance some fifty years ago of Mr. Garner's 'Natural History of the County of Stafford.' But, as will be seen by the two pages of bibliography at the end of the present volume, there have been a certain number of fragmentary contributions printed from time to time in the pages of local Natural History journals and county histories. From these and other sources (such as Plot's well-known work, 1686, and Ray's translation of Willughby's 'Ornithology,' 1678) Dr. McAldowie has compiled a goodly catalogue of county birds, adding remarks of his own. But it seems to us that a number of species have been included on very slender evidence. For example, there appears to be little or no ground for ranking amongst Staffordshire birds such species as the Dartford Warbler, Aquatic Warbler, Bearded Tit (though this species was thought to have formerly frequented Aqualate Mere), Richard's

Pipit, Mealy Redpoll, Pine Grosbeak, Black Woodpecker, Roller, Marsh Harrier, Little Crake, and Roseate Tern.

The greatest "ornithological ornament of the county" is stated to be the Great Crested Grebe, and the meres in the West of Staffordshire, together with those of Shropshire, form one of the chief breeding areas of this species in the British Islands.

The accounts given by Willughby and Plot of the great breeding place of the Black-headed Gull at Norbury, in this county, are of course quoted under the head of this species (pp. 135-136), and Ray's note of his visit to the spot in May, 1662, when on his way from Stafford to Nantwich ('Itinerary,' pp. 216-217). But we are surprised to read that since Dickenson wrote in 1798 to the effect that since 1794 scarcely a Gull has bred in that neighbourhood, "there is no record of any more recent nidification of the Black-headed Gull in this county."* Dr. McAldowie does not tell us whether this species has actually ceased to breed in Staffordshire for exactly a century, or what is its precise status in the county at the present time.

It is curious, too, that the author has not been able to find any record of the former occurrence of the Bustard on Cannock Chase. Possibly in the days when Bustards frequented the wolds of Lincolnshire and Yorkshire, and the downs of Berkshire, Wiltshire, Hants, and Sussex, the heather upon Cannock Chase may have been too long, and the ground too hilly, for a bird which trusts so much to its legs and sharp vision in the open plains.

The seven illustrations with which this volume is embellished are, with one exception, from photographs, and give a good idea of some of the more notable bird-haunts to be met with in the county. The views given are the Raven's Clough (at the bare and rugged east side of Cloud End), the Trent near Burton, the summit of the Roaches (the breeding place of the Ring Ouzel and Curlew), Dane Valley (the haunt of the Dipper, Grey Wagtail, and Sandpiper), Cannock Chase, Dovedale, and Aqualate Mere the favoured resort of the Great Crested Grebe.

* This colony is referred to in an article on "Gulleries" published in 'The Field' of 2nd Feb., 1884.